



**US Army Corps
of Engineers**

Use of Recycled Plastics Versus Wood

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Purpose

This technical note provides information on the present and potential uses of recycled plastic "timbers" in parks and recreation areas. Observations of direct onsite application have determined that recycled plastics are a cost-saving alternative to traditional lumber and wood products in certain applications. Two sites—Hartwell Lake and the Old Faithful Area of Yellowstone National Park—are cited here.

Background

Over the past few years, innovations in the design and construction of recycled post-consumer plastics have become a favorable way to save money and protect the environment. With the recent introduction of recycled plastic "timbers," this efficient application is gaining popularity as a durable, long-lasting alternative to the creosote-treated timbers and pressurized lumber used for decades.

Recycled Plastics

In the arena of outdoor recreation, new technologies, products, and services are resulting in better and more effective means for providing recreational facilities across the nation. Creosote-treated crossties, decking (on courtesy docks, etc.), and wooden playground facilities are being replaced at Hartwell Lake and throughout other projects in the U.S. Army Engineer District, Savannah. Although possibly less aesthetically pleasing, plastics, especially recycled plastics, are proving to be more durable and longer lasting than conventional wood products. These products typically come with up to a 50-year manufacturer warranty and are alleged to have a life expectancy equivalent to glass. Manufactured in 100-percent plastic or a mixture of 50 percent plastic-50 percent wood, these products are available in most shapes and sizes comparable to lumber. They can also be handled like lumber. Although the purchase price of recycled plastics is more expensive than wood (plastic crossties averaged \$45



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each compared to \$10 for its wooden counterpart), the long-term savings in labor and materials for replacing rotted conventional crossties (on average once every 4 to 7 years) will more than offset the initial investment.

Practical Plastics at Hartwell Lake

Recycled plastics were first used at Hartwell Lake on an experimental basis in May 1992, after their potential was recognized through Savannah District's suggestion program. Mr. James Payne, Hartwell Lake's Supervisory Construction Representative, initially worked with the O&M contractor and with several recycled plastics vendors on two test picnic sites. Uses to date have included crosstie equivalents for landscaping, campsite and picnic site construction, road borders, and wheel stops. In addition, recycled plastics have been used for picnic table construction, decking on courtesy boat docks, and trashcan holders. Recycled plastics are also being used extensively at J. Strom Thurmond Lake, Savannah District.

Because of differences between recycled plastics and wood, several factors must be considered. The greatest difference is in expansion and contraction. Plastics expand and contract to a greater degree than wood, resulting in tight fits in the summer and wide gaps between joints in the winter. The structural strength of plastics is less than wood. Depending on type, size, and use, more support and/or larger sizes are needed for use in picnic tables, decking, etc., when supporting weight is the primary function. Plastic lumber cannot be used in building construction. However, these are all minor problems that can be mitigated.

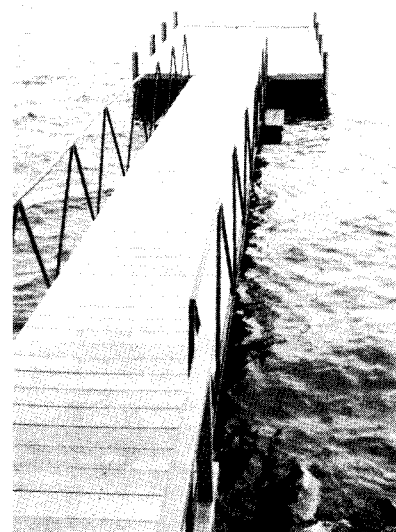
Applications at Yellowstone National Park

Use of recycled plastics at the Upper Geyser Basin, near Old Faithful, was described in a recent issue of *Park Science*.¹ Last year, Yellowstone Park replaced approximately 9 m (30 ft) of traditional boardwalk with lumber made from recycled plastic, donated by a supplier. Eventually, Yellowstone hopes to replace about 305 m (1,000 linear ft) of boardwalk with the recycled plastic material.

¹ "Highlights," *Park Science* 15(3), 8.



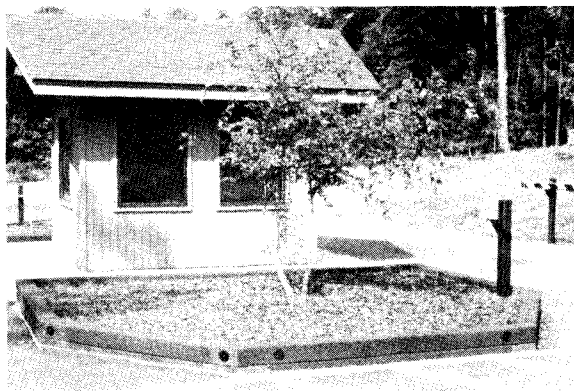
Sign requesting comments about use of recycled plastics (sign is mounted on a plastic 4 x 4)



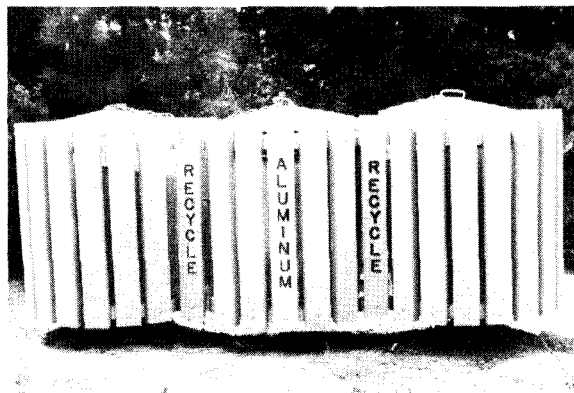
Courtesy dock at Big Oaks Park (dock and walkway decked with plastic lumber)



**Plastic bench and plastic trashcan holder
(far left)**



Plastic cross-ties around gatehouse



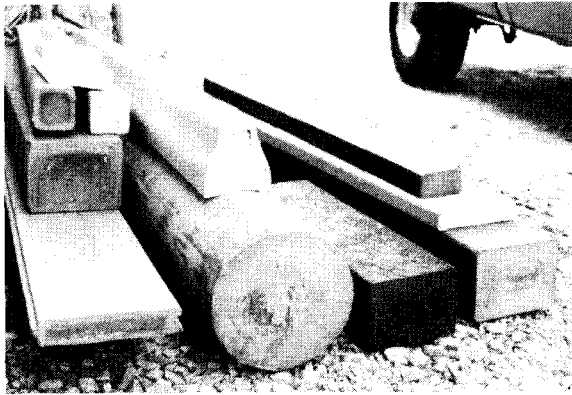
**Triple plastic trashcan holder with
"Aluminum Recycle" routed into the plastic**

The "lumber," made of materials recycled from thick plastic bottles such as milk containers, is 90 percent recycled post-consumer plastic and comes in an array of colors, including weathered wood. The geyser basin boardwalk encounters an interesting array of stresses—from weathering due to geyser activity, to strolling bison—and as such makes a good proving ground for the material. Yellowstone's engineers also found the plastic lumber to be a favorable replacement for wood products. In testing, the material's color changes little over time, and the lumber will not rot, warp, splinter, or crack from exposure, above all requiring very little maintenance. It can be cut and drilled like wood, and it can be fastened with ordinary screws or nails. Like Hartwell Lake's applications, Yellowstone's data concur that recycled plastic is not as rigid as wood and cannot be used for building construction. However, the many other uses of recycled plastics have gained acceptance from several other parks. In all, nine other parks have received recycled materials, including the Washington, DC, mall; Martin Luther King, Jr., National Historic Site, Georgia; and Mount Ranier National Park, Washington. Yellowstone is the first to install the donated recycled materials.

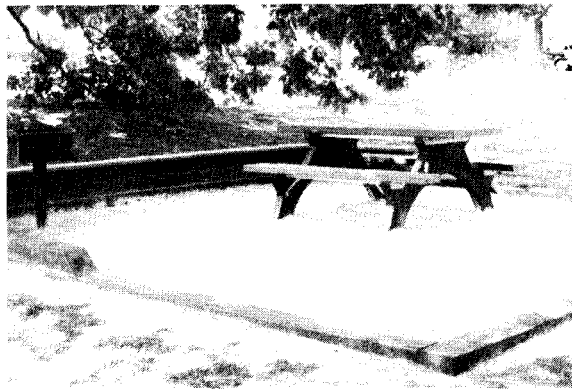
Advantages

Clearly, the greatest advantage of using recycled plastic is the long-term cost savings. Additionally, once the project has served its purpose or reached the end of its useful life, the material can be returned to the manufacturer or other recycler for recycling, thus saving disposal costs and landfill space. Water-related uses appear to have advantage over wood. Wood naturally becomes very

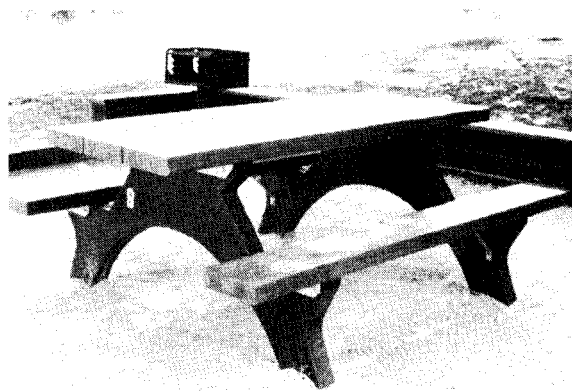
slippery when wet. Plastic, however, seems to become more slip-resistant when wet. Hartwell Lake staff has observed a piece of plastic (approximately 5 cm × 10 cm × 1 m) that was submerged for nearly a year. When retrieved, it showed that algae and other aquatic growth are easily cleaned off, leaving a nonslip surface. As a result, Hartwell Lake hopes to replace tread plates on stairways over bulkhead walls leading to the lakeshore (which are subject to frequent inundation, resulting in algae growth) to reduce and mitigate the hazardous conditions associated with the current wooden



Plastics come in various shapes, sizes, and colors (pile of plastic lumber samples)



Picnic impact site 8 at Big Oaks Park, where all items are 100 percent plastic (table, crosstie border, and top bench board on crossties)



Closeup view of 100-percent plastic table at picnic impact site 8, Big Oaks Park

walking surfaces. Also, certain types of vandalism are easily repairable. Initials and other carvings are easily remedied by using a hot "iron" and plastic shavings, and "melting" a new smooth finish over the vandalism.

Summary

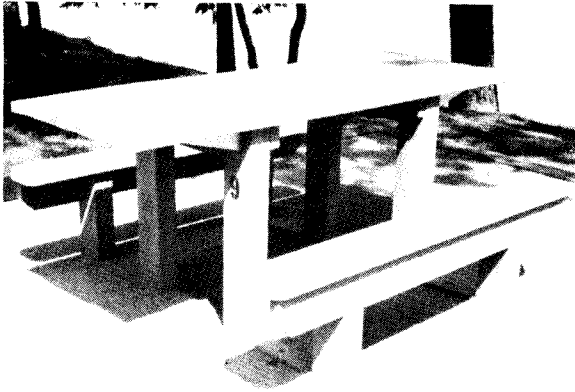
Recycled plastics are still relatively new in the outdoor recreation market, and the claims of the manufacturers will only be proven through time. If the advantages of recycled plastics continue or increase, future rehabilitation and renovation costs should show a marked decline.

Point of Contact

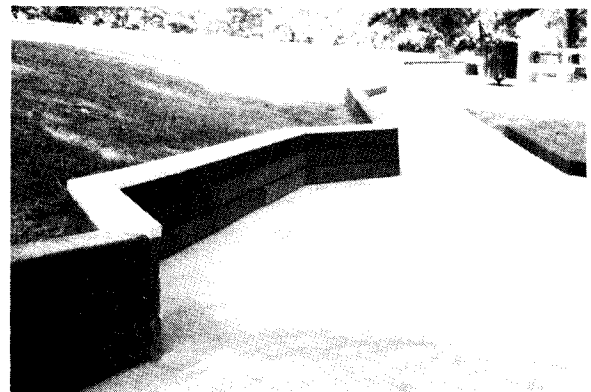
This technical note was written by Mr. Scott Strotman, Park Ranger, Hartwell Lake, U.S. Army Engineer District, Savannah, (706) 376-4788.



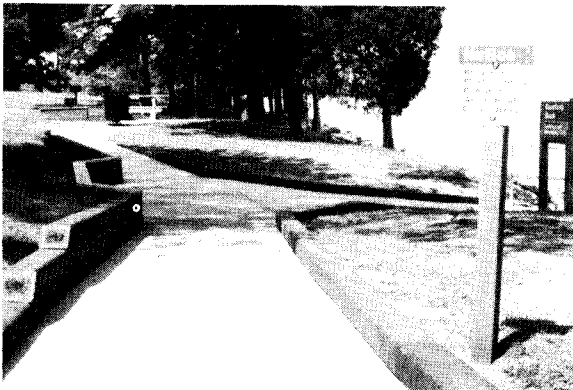
Picnic impact site 9 at Big Oaks Park, where all items are 50 percent plastic-50 percent wood



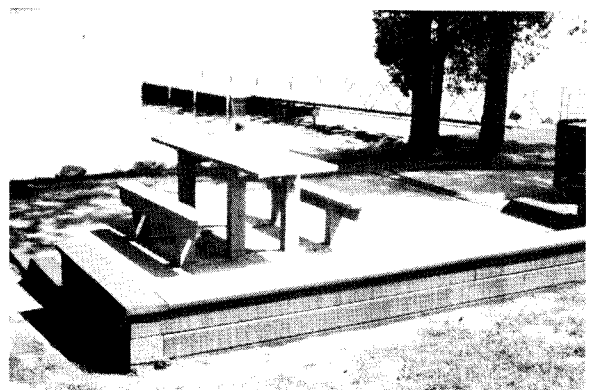
Closeup view of 50-percent plastic, 50-percent wood table at picnic impact site 9, Big Oaks Park



Retaining wall of plastic cross-ties with plastic "bench" board on top



General view of plastic facilities with sign in foreground



View of plastic picnic site with plastic decked courtesy dock in background, Big Oaks Park



Plastic wheel stop with wood cross-tie wheel stops in background